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ically, and need no discussion. Certain serious questions of a practical nature are, however, properly raised. Are basic statistics sufficiently refined to justify or require methods as elaborate as those used in Professor Day's data? Is it not probable that the use of an ordinary weighted arithmetic index would produce results as satisfactory? Such consideration seems to transfer the emphasis in the study of production to the matter of obtaining original data instead of allowing too much effort to be spent in elaborate computations. Since production is not as yet upon anything like as exact a statistical basis as prices and foreign exchange, undue refinement is misleading. It is worth noting, too, that while annual figures on such subjects are of historical interest, the real use of such indices as those of Professor Day will appear only when a simple and practical monthly measure of production is obtained. In general, a question must always arise as to how far we can understand and use composite results when we have so little relative knowledge of the different parts of the field. Research into the condition of special industries is an essential supplement and may be considered the next field to be cultivated, rather than the general index field.

H. PARKER WILLIS

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*War Costs and Their Financing.* By Ernest Ludlow Bogart. New York: D. Appleton and Company, 1921. Pp. xxiv, 510.

One of the most remarkable features of the World War was the ability of the various belligerents to endure the economic strain for so long a period. At the outbreak of the conflict it was generally predicted that it would be short because the expensiveness of modern warfare would soon lead to the economic exhaustion of the belligerents. But for four long years the struggle raged with constantly augmenting fury and mounting expenditure. Consequently to every belligerent the problem of finance—the raising of funds to meet the huge expenditures involved—presented itself as one of enormous magnitude.

In *War Costs and Their Financing*, Professor Bogart has calculated the expenditures of the principal nations engaged in the war and has described the manner in which these expenditures were provided for. His study of war financing necessarily involved consideration of paper money issues and bank credit in the various warring countries. Less directly related to the main discussion of the book are chapters dealing with the financing of Europe after the war, and with post-war problems of currency, debt, and taxation. In the final chapter an attempt is made to summarize all the costs of the war, indirect costs as well as the direct outlays of the belligerent nations. An introduction is contributed by R. C. Leffingwell, former assistant secretary of the Treasury. In the appendices are contained various moratorium proclamations, liberty bond acts, and statistics of taxation and debt in the United States.

In this volume Professor Bogart gives only a summary statement of the expenditures of the belligerent countries. More detailed calculations are found in his study on *Direct and Indirect Costs of the Great World War*, from which most of the statistics in the present book are taken. His final figure for the total net

expenditures of all the nations during the four and one-half years of war is \$186,000,000,000. This amount is to a considerable extent based upon estimates and guesses because of the failure of some of the belligerent countries to publish statements of expenditures, and of others to distinguish clearly between war and ordinary expenditures.

Throughout the book foreign currencies have been converted into dollars at approximately the pre-war mint par rates of exchange. In order to combine the figures for various countries, it was, of course, necessary to reduce all currencies to a common denominator. Perhaps the method employed by the author was the only practicable one; but it should be realized that owing to the depreciation of the currencies of all of the belligerents as compared with our dollar, the author's method of conversion leads to an exaggeration of the total costs of the war. For instance, assume that Germany's expenditures were 160,000,000,000 marks. Converted at the approximate pre-war rate of 25 cents to the mark, this sum is equivalent to \$40,000,000,000. But considering the heavy depreciation of the mark, can it be said that the expenditure of 160,000,000,000 marks represented the same amount of economic goods as that of \$40,000,000,000?

The fluctuations in the values of the currencies of the various countries give a tinge of unreality to much of the statistical estimation of the cost of the war, and necessitate wariness on the part of the investigator in drawing conclusions from his statistics. It is to be feared that in some cases the author himself has stumbled. For example, in order to convey some impression of the huge cost of the war, he states that during its last year it was in some countries already costing more in a single year than the estimated pre-war income of the whole people, and in all other countries except the United States it was approaching very close to this point. In support of this statement there is given a table showing in dollars the annual pre-war income of various countries and their war expenditures in 1918. But the war expenditures of 1918, as the author elsewhere clearly notes, were incurred in terms of a currency grossly depreciated as compared with the pre-war currency. In other words, the measuring rod of value in 1918 had become an entirely different unit from that of 1913, and conclusions based upon the assumption that they were identical are unwarranted. Similarly, a distorted impression is created by the tables on pages 371 and 372 in which the pre-war wealth and income of the belligerents are compared with their present debts and interest charges.

If the author was forced in many cases to estimates and guesses in calculating the direct outlays of the belligerent governments, to a far greater degree was he driven to the realm of conjecture in determining the indirect costs of the war, such as those represented by loss of life, property losses, loss of production, loss to neutrals, and war relief, all of which the author estimates at \$151,600,000,000. In particular is this true of the item "loss of life," which is placed at approximately \$67,000,000,000 for both soldiers and civilians. In view of the widely divergent estimates from various authorities on the value of a human life, these figures might be halved or doubled according to the taste of the compiler. Indeed, it is very questionable whether such an item should be included at all. Stated in terms of human suffering, of heart pangs endured through the loss of

dear ones, the value to be placed upon the lives lost is incalculable. But if the purpose is to show how much worse off the world is economically as a result of the war, as is true in the present instance, the thesis might be defended that the lives lost will ultimately redound to the economic benefit of the survivors because of the lessened pressure of population upon the means of subsistence. In justice to Professor Bogart it should be said that in his previous study on *Direct and Indirect Costs of the Great World War*, from which his estimates are taken, he refers to this capitalization of human lives lost as a "procedure of doubtful statistical propriety."

The bulk of the book is taken up by a consideration of the ways and means employed by the belligerents in providing for war expenditures. In all countries the principal income was obtained from loans, but the policies of Great Britain and of the United States may be clearly differentiated from those of the other belligerents. Only in the two former countries was a serious effort made to finance the war by resort to heavy taxation. The author considers that these two countries fairly fulfilled H. C. Adams' ideal of the financial management of a war, namely, a "tax policy assisted by credits, rather than a credit policy assisted by taxes," although in the United States only about one-third of the total expenditures were provided for by taxes, and in Great Britain only one-fourth. These achievements, however, were so superior to those of any of the other nations that they shine by comparison. In no other important belligerent country were tax revenues sufficient to meet even ordinary civil expenditures and to pay the interest on the debt.

Certain general features in the financial policies of the belligerents may be noted. The usual procedure was to raise funds by the issue of short-term Treasury bills, which were later funded by the issue of long-term bonds. In all countries great reliance was placed upon the banks, which advanced funds to the governments either through the creation of credits, as in Great Britain and the United States, or by the issue of bank notes, as on the Continent. The result of this policy was world-wide inflation of currencies with its concomitants of high prices and increasing governmental expenses. The general employment of excess profits and income taxes is noteworthy. Especially important were these taxes in Great Britain and in the United States. Indirect taxes were relied upon principally by the other belligerents.

The war has left the belligerent nations staggering under colossal debts and saddled with grossly inflated currencies. Professor Bogart thinks that except in the case of the United States there is little probability of any substantial contraction of indebtedness in the near future, unless there is resort to drastic procedure such as capital levies or outright repudiation. He is similarly pessimistic with regard to the likelihood of deflation and price declines. Perhaps he would have been less so had the book gone to press a few months later, in view of the radical fall in prices in most countries of the world during the past year.

In attempting to cover the war financing of all the principal belligerents, the author has had before him a vast field for research. The gaps in the published material available and limitations in space at his disposal have precluded final statistical exactness or fulness of detail in his treatment of the subject. He has,

however, given a very readable general survey of a very large and complex problem. Written in untechnical terms, the general reader especially will find it an enlightening presentation of the financial angle of modern warfare. Furthermore, an estimation of the economic cost of war, although subject to unwarranted use in some specific applications as has been pointed out, nevertheless is worth while because of the force with which the stupendous total strikes the imagination as one of many reasons for the abolition of war.

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*Report on the Pandemic of Influenza, 1918-1919.* Ministry of Health of Great Britain. H. M. Stationery Office, 1920. Pp. 577.

Our members will be interested in the material given in this report on the epidemiology of influenza, especially in view of the statement that "the epidemiological features of the pandemic are even more complex and puzzling than the clinical characteristics, and the present report does little more than present a large body of data which await interpretation" (p. xii). American statisticians can join with their British brethren in developing methods of analysis which express the outstanding characteristics of the data. They may help the epidemiologists in arriving at concise descriptions of the epidemic course and allied characters. The epidemiologists are not satisfied with any of the theories so far advanced as explanations of the pandemic. "We have passed, it is true, from the former theories regarding origin—the miasmatic theory, the telluric and climatic theories; the importation theory; or the idea that influenza is a specific disease like anthrax, arising and progressing within narrow and definitely circumscribed limits. These are hypotheses no longer confidently held. They do not answer the fundamental questions raised by the pandemic through which we have passed." Some of the features of the pandemic in its local and general phases which seem to require newer and better statistical measures and aids to interpretation are:

#### A. DESCRIPTIVE AND ANALYTIC EXPRESSIONS FOR WAVE-FORMS

The data to be handled comparatively are the facts of (1) periodicity, (2) case-incidence, and (3) case-fatality. At present all that can be concluded is that "the broad facts remain that the epidemic presented three waves and that they differed in form. The first, short, sharp and high; the second, slower in formation, flatter, higher and more destructive of life; the third, also slow in formation, lower, more prolonged in decline, and partially reverting to the older influenzal form—a condition of things which suggests a biological factor modified by environment, but not, unhappily, directly controllable by human agency" (p. xiii).

#### B. MEASURES OF "EXPLOSIVENESS" OR EPIDEMICITY, RAPIDITY OF EXTENSION, DIRECTION OF PANDEMIC COURSE

Professor Raymond Pearl, of the Johns Hopkins University School of Hygiene, in his *Influenza Studies* I, II, III, and IV, has suggested several measures of